

**15th International Symposium
on Aerodynamics, Ventilation
& Fire in Tunnels 2013**

**Barcelona, Spain
18-20 September 2013**

ISBN: 978-1-62993-387-0

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2013) by BHR Group
All rights reserved.

Printed by Curran Associates, Inc. (2014)

For permission requests, please contact BHR Group
at the address below.

BHR Group
The Fluid Engineering Centre
Cranfield, Bedfordshire MK43 0AJ
United Kingdom

Phone: +44 1234 750422
Fax: +44 1234 750074

contactus@bhrgroup.co.uk

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

15th International Symposium on
AERODYNAMICS, VENTILATION & FIRE IN TUNNELS
Barcelona, Spain: 18–20 September 2013

CONTENTS

FOREWORD	1
A Retrospective View by Eur. Ing. Ian J Cockram	3
William D Kennedy, 1942 - 2012	5
ROAD TUNNELS	
Aerodynamics	
Performance evaluation of jet fan deflectors for road tunnel longitudinal ventilation <i>G Clark, D Saunbury, D Bagshaw, M Buonfiglioli, Atkins Ltd, UK</i>	9
Numerical study of effects of vehicle speed and spacing on the ventilation in a highway curved tunnel <i>Feng Wang, Dalian University of Technology and Sichuan University; Mingnian Wang, Yuanye Deng, Southwest Jiaotong University; Qingyuan Wang, Sichuan University; Guohai Dong, Dalian University of Technology, China</i>	27
Experimental and numerical investigations of the wind pressure coefficient at a tunnel portal <i>T Kubwimana, A Mos, Centre d'Etudes des Tunnels; E Bergamini, P Salizzoni, P Méjean, Ecole Centrale de Lyon; France; M Boffadossi, Politecnico di Milano, Italy</i>	39
An evaluation of how the air-flow from ceiling-mounted-ESP outlet ducts affects moving cars <i>S Kanda, S Masukura, Central Nippon Expressway Company Limited; A Kobayashi, M Yokota, Central Nippon Highway Engineering Tokyo Company Limited, Japan</i>	55
Probabilistic approach for longitudinal ventilation system design in fire situations <i>S Fernández, FFII – CEMIM; A Fraile, I Del Rey, E Alarcón, ETSII-Universidad Politécnica de Madrid, Spain</i>	67
Safe escape route corridors in tunnels, a new approach for escape route ventilation design <i>S Boekelman, Royal HaskoningDHV, The Netherlands</i>	81

Upgrade of an existing transverse ventilation system to a longitudinal system using a Saccardo nozzle <i>J Alston, D Kandra, R Potter, Arup, USA</i>	89
Consideration of a Saccardo nozzle system for tunnel ventilation applications: A simple calculation method for a one dimensional approach <i>P Sturm, M Beyer, M Bacher, Graz University of Technology, Austria</i>	105
Efficient 3D CFD investigation of ventilation system design of road tunnels <i>D K H Wu, Y F Lin, H S Zhen, Parsons Brinckerhoff (Asia) Ltd., China</i>	121
Air curtains used for separating smoke free zones in case of fire in tunnel <i>G Krajewski, Building Research Institute, Poland</i>	131

ROAD TUNNELS

Smoke Ventilation

New findings on the use of flexible curtains for smoke management in road tunnels <i>S Rigert, M Bettelini, Amberg Engineering Ltd, Switzerland</i>	147
Upgrading the existing full transverse ventilation system to meet a 100 MW fire <i>P Kumar, J Solar, Parsons Brinckerhoff, N Harvey, Hatch Mott MacDonald, USA</i>	161
Aerodynamics of buoyant gases within a longitudinally ventilated tunnel: experiments in two different reduced scale models <i>J Le Clanche, P Salizzoni, M Creyssels, Ecole Centrale de Lyon; R Mehaddi, F Candelier, O Vauquelin, Institut Universitaire des Systèmes Thermiques Industriels (IUSTI), France</i>	175
Impact of fire source characteristics and wall heat losses on smoke behaviour in a longitudinally ventilated reduced scale model tunnel: experiments and numerical simulations <i>A Mos, CETU; J Le Clanche, P Salizzoni, M Creyssels, C Nicot, Ecole Centrale Lyon, France</i>	189
Numerical quantification of fire smoke toxicity in tunnels <i>F Rabe, A Löhnert, C Knaust, S Thöns, BAM Federal Institute for Materials Research and Testing, Germany</i>	203
An integral fire model and critical velocity in longitudinally ventilated tunnel with gradient <i>Q Zhang, A Paladini, A Canfora, D Cappello, P Grasso, GEODATA Engineering SpA, Italy; X Guo, Dalian University of Technology, China</i>	217
A modified critical velocity for road tunnel fire smoke management with dedicated smoke extraction configuration <i>Y Liu, S Cassidy, HNTB Corporation, USA</i>	231

ROAD TUNNELS

Fire

- Fire risk assessment and mitigation for the installation of transmission cables in vehicular tunnel 249
K H L Wong, Y Song, Ove Arup & Partners Hong Kong Ltd., China
- Wall temperatures for road tunnel fire scenarios 265
M Bilson, P Kumar, Parsons Brinckerhoff; N Harvey, Hatch Mott MacDonald, USA
- Determination of an HGV fire heat release rate profile 281
K J Harris, J L Harder, Parsons Brinckerhoff, USA
- Mathematical modelling of fires in short road tunnels. Influence of tunnel geometrical parameters on the people safety at fire 295
A V Karpov, D V Ushakov, All-Russian Research Institute for Fire Protection (VNIIPPO); A N Giletich, A A Panov, Emercom of Russia, Russia

ROAD TUNNELS

Ventilation Control

- Peculiarities of control ventilation in the Kuznetsovsky railway tunnel 309
S G Gendler, Open joint – stock company “LenMetroGiproTrans”, Russia
- Zero-flow response to fire in longitudinally-ventilated tunnels 323
I Nakahori, Sohatsu Systems Laboratory Inc., Japan; S Jiang, Chongqing Communications Research & Design Institute, China; A Vardy, University of Dundee, UK
- Control strategies of the tunnel ventilation system for Ohashi junction 337
H Saito, K Kitajima, Metropolitan Expressway Company Limited, Japan
- The fully automated ventilation response for the fire situation in the Prado-Carénage tunnel in Marseilles 351
E Casalé, Thônes & Aix-Marseille Université; D Monnier, Société Marseillaise du Tunnel Prado-Carénage; S Lavaux, International Conseil Service Etudes; G Giovannelli, Centre Scientifique et Technique du Bâtiment; O Vauquelin, Aix-Marseille Université, France
- Bi-national Bielsa-Aragouet tunnel: Intelligent traffic and ventilation system enabling alternate bidirectional and unidirectional traffic flow 367
P Personna, Consortium Tunnel Bielsa-Aragouet; F Portugués, D Octavio, R Sánchez, L M Gonzalo, Geocontrol, Spain

METRO AND RAIL

Aerodynamics

Cross passage pressurisation with non-incident tunnel impulse devices: approximation methodology for system design <i>S O’Gorman, R Nuttall, Parsons Brinckerhoff, Australia</i>	383
Rail tunnel ventilation and train egress interaction <i>A Purchase, P Gehrke, S O’Gorman, Tunnel Ventilation, Fire Life Safety Engineers, Australia</i>	403
Dust in railway tunnels – causes, risks and countermeasures <i>J Rodler, B Hagenah, Gruner GmbH; R Lassy, Wiener Linien GmbH & Co. KG, Austria</i>	419
Comparison of 3D CFD simulation approach for aerodynamics effects in high speed railway tunnel system <i>D K H Wu, Parsons Brinckerhoff (Asia) Ltd; E H T Xu, University of Shanghai for Science and Technology, China</i>	433

METRO AND RAIL

Thermodynamics and Cooling

Heat waves and their influence on tunnel environments <i>J A Thompson, M J Gilbey, Parsons Brinckerhoff; S Kemp, London Underground Ltd, UK</i>	445
Operation of evaporative cooling systems on metros <i>M J Gilbey, Parsons Brinckerhoff Ltd; G Archer, Private Consultant, UK</i>	461
Ice formation – aspects of planning and measures for climate impact <i>V Langner, B Hagenah, Gruner GmbH, Austria; T Cronvall, VR Track Oy, Finland</i>	477
Efficient tunnel cooling using tunnel wall heat extraction <i>C Biotto, D Eckford, Mott MacDonald; A Q Chen, Arup, UK</i>	491
Use of Platform Screen Doors and the benefit of surrounding tunnel wall and soil thermal inertia for the normal operation of metro tunnels under tropical weather area: Application to the Chennai metro project (India) <i>F Waymel, L Fournier, L Plagnol, Egis Tunnels, France; H Prasad, B Umesh Rai, Chennai Metro Rail Limited (CMRL), India</i>	507

METRO AND RAIL

Pressure Transients

Fuzzy criteria for pressure comfort in tunnels <i>A Vardy, University of Dundee, UK</i>	525
--------------------------------------------------------------------------------------------	-----

Countermeasure against the micro-pressure wave by a shelter linking neighboring tunnels <i>T Fukuda, S Saito, M Iida, Railway Technical Research Institute; T Kurita, East Japan Railway Company; S Ozawa, Tokyo University of Technology, Japan</i>	539
Pressure-wave studies in the tunnel-simulation facility Göttingen (TSG) <i>D Heine, K Ehrenfried, C Wagner, German Aerospace Center DLR Göttingen, Germany</i>	553
Measurements and prediction of the pressure variations at cross passages in high-speed railway tunnels <i>L Hermans, A Grande, Centro de Modelado en Ingeniería Mecánica (CEMIM); J Fernández, I Del Rey, Universidad Politécnica de Madrid, Spain</i>	565
Micro-pressure wave countermeasures realized in the Katzenberg tunnel and introduction of a new German micro-pressure wave regulation <i>P Deeg, M Hieke, C Gerbig, T Tielkes, DB Systemtechnik GmbH, Germany</i>	577

METRO AND RAIL

Fire

The impacts of train fire profiles on station ventilation system design <i>S Li, A Louie, E Fuster, Parsons Brinckerhoff, USA</i>	591
A detailed CFD simulation on the effect of ventilation system operation on smoke control in the 2003 Daegu Subway Station fire <i>J Choi, N Hur, Sogang University, Korea</i>	607
Tools for fire hazard analysis of passenger rail vehicles <i>J Alston, K Schebel, Arup, USA</i>	619
Simulations and implementation of Pajares Tunnel, and Barcelona Sants- la Sagrera Tunnel, ventilation systems in Spain HSR (AVE) network <i>A Ruiz-Jimenez, E Barrio, A Matas, TD&T, Spain</i>	633

METRO AND RAIL

Fire Suppression

The energy budget in suppressed tunnel fires <i>F Tarada, Mosen Ltd, UK; L M Noordijk, Efectis Nederland BV, The Netherlands; M K Cheong, W O Cheong, K W Leong, Land Transport Authority of Singapore, Singapore</i>	649
Fire curve for tunnels with deluge suppression system <i>A D Lemaire, L M Noordijk, M Vermeer, Efectis Nederland BV, The Netherlands; M K Cheong, W O Cheong, Land Transport Authority of Singapore, Singapore</i>	663

CFD simulations of ventilation effects on water mist fixed fire suppression systems on tunnel fires <i>A X Wang, K Kottom, Hatch Mott MacDonald; N Rhodes, Parsons Brinckerhoff; R Trapani, Parsons Transportation, USA</i>	677
Ventilation and FFFS fire tests for "Calle 30" road tunnels <i>S Fernández, A Grande, I Espinosa, FFII – CEMIM; I Del Rey, E Alarcón, ETSII-Universidad Politécnica de Madrid, Spain</i>	687
Design fire heat release rate in road tunnels with fixed fire fighting systems <i>B J Melvin, C A Hawkins, R C Moreno, Parsons Brinckerhoff, USA</i>	703
Capability of a CFD tool for assessing a water mist system in a tunnel <i>E Blanchard, LEMTA Nancy Université and CSTB; P Boulet, LEMTA Nancy Université; P Carlotti, CSTB, France</i>	717
Numerical simulations of the interaction of water spray fire suppression and emergency ventilation systems in vehicular tunnels <i>Y Li, J Fay, Jacobs Engineering; D Kandra, J Alston, Arup, USA</i>	729

METRO AND RAIL

Aerodynamics Testing and Equipment Design

A full scale test to determine the installation coefficient improvement of a new jetfan <i>A Valente, Systemair S.r.l., Italy; H Rudelgass, Systemair GmbH, Germany</i>	747
Contact force disturbances of the pantograph system due to air flow at high-speed trains in tunnels <i>M Flueckiger, P Reinke, S Nyfeler, HBI Haerter Ltd, Switzerland; W Kapfenberger, ÖBB Infrastruktur AG, Austria</i>	763

METRO AND RAIL

Fire Testing

Heat release rates of heavy goods vehicle fires in tunnels <i>M K Cheong, W O Cheong, K W Leong, Land Transport Authority of Singapore, Singapore; A D Lemaire, L M Noordijk, Efectis Nederland BV, The Netherlands; F Tarada, Mosen Ltd, UK</i>	779
Full-scale fire testing for fire detection, fire suppression and ventilation of I-90 tunnels in Seattle <i>I Maevski, B Josephson, R Klein, Jacobs Engineering; D Haight, Z Griffith, WSDOT, USA</i>	789
Full scale fire tests on Metro cars of the Vienna Public Transport <i>B Stodola, R Lassy, Wiener Linien, Austria</i>	805

AUTHOR INDEX